

# Design Guidelines for County Required Littoral Shelf Planting Areas (LSPA)

## STEP 1: Consult Regulations

The requirements for design, maintenance and alteration of Littoral Shelf Planting Areas (LSPAs) can be found in the Collier County Land Development Code Chapter 3, Section 3.05.10.

[https://library.municode.com/HTML/13992/level2/CH3REPR\\_3.05.00VEREPRPR.html#CH3REPR\\_3.05.00VEREPRPR\\_3.05.07PRST#TOPTITLE](https://library.municode.com/HTML/13992/level2/CH3REPR_3.05.00VEREPRPR.html#CH3REPR_3.05.00VEREPRPR_3.05.07PRST#TOPTITLE)

For information about regulated exotics refer to [Chapter 5B-64.011](#) of the F.A.C.

## STEP 2: Determine the Hydroperiod

A hydroperiod can be defined as the number of days per year that an area of land is dry or the length of time that there is standing water at a location (Gaff et al. 2000). Hydroperiods are one of the biggest factors affecting littoral plants within a stormwater lake and should be considered whenever designing a littoral shelf planting area (LSPA).

Hydroperiod and planting elevation in a stormwater lake are interconnected. The tolerance level of different wetland plants varies. Some plants can survive in deeper water with year-round flooding. Other plants cannot survive deep water but still need some flooding. Once the hydroperiod of a lake is approximated, each plant's maximum water depth and flooding duration must be considered before determining its planting elevation.

[Table 1](#) lists the approximate hydroperiod ranges for some typical native wetland plants. The plants have been divided into 4 planting zones (Figure 1). These planting zones are determined based on a plant's maximum water depth (the maximum water depth under which a plant can survive) and flooding duration (the amount of time a plant can survive under water).

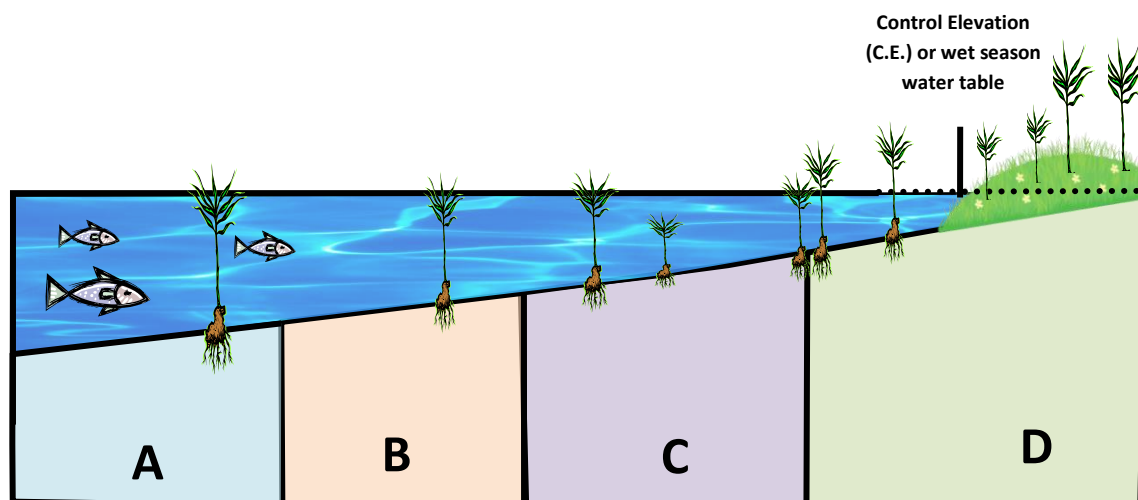


Figure 1. Planting Zones

- (A) **Deep** – These plants need at least 9 –11 months of flooding per year and can survive in water that is 3 feet deep or greater.
- (B) **Mid** – These plants need at least 3.5 – 8.5 months of flooding per year and can survive in water that is 2 to 3 feet deep.
- (C) **Shallow** – These plants typically grow in water that is 1 to 2 feet deep and are inundated by water for at least 2.5 months annually.
- (D) **Transitional** – These plants can survive in water that is 0 to 1 foot deep and do not need to be completely flooded. Some just require wet or soggy soils.

### Step 3: Determine Planting Elevation

Most stormwater pond levels in Collier County fluctuate quite a bit between the wet and dry seasons. Each elevation along a shoreline has a different hydroperiod and is based on the yearly fluctuation between the **Dry Season Water Table (DSWT)** and the **Control Elevation (C.E.)**. The DSWT should be the average water elevation during the driest time of the year – typically the months of April and May. The C.E. (wet season water table) should be the average water elevation during the wettest time of the year – typically the months of September and October. Some lakes may only fluctuate by 1 foot; others may fluctuate by as much as 6 feet.

In ponds with a fluctuation of 5' or greater, plant survival can be a challenge. It is advised that only the hardiest of plant species be chosen in lakes with this type of fluctuation. This will increase the likelihood of vegetative success and higher potential for propagation. Hardy species might include: spikerush, soft rush, bulrush, alligator flag and sand cord grass.

Table 2 is an estimate of the planting elevations for the groups of plants from Table 1, according to average water level fluctuation

**Table 2. Estimated Planting Elevations Based on Hydroperiod Fluctuation**

Zone	2' or less fluctuation
(A) & (B)	2' or greater below C.E.
(C) & (D)	0' - 2' below C.E.

Zone	3' or greater fluctuation
(A)	3' or greater below C.E.
(B)	2' - 3' below C.E.
(C)	1' - 2' below C.E.
(D)	0' to 1' below C.E.

This is a simplified table. When designing a LSPA, keep in mind that many plants and trees may fit multiple categories. Some (A) plants may survive at (B), (C), and (D) plant levels; some (B) plants may survive at (C) and (D) plant levels, and so on. Just remember that almost all of these plants will be underwater at some point during an average rainfall year.

#### Step 4: Select Design

If you are modifying an existing pond to meet current code or are excavating a new pond, the current littoral planting code is intended to concentrate the littoral plantings in one area of the lake – a Littoral Shelf Planting Area (Figure 2). **Keep in mind that the design figures below are examples and only original plans specific to each unique site will be accepted as part of the permit submittal.**

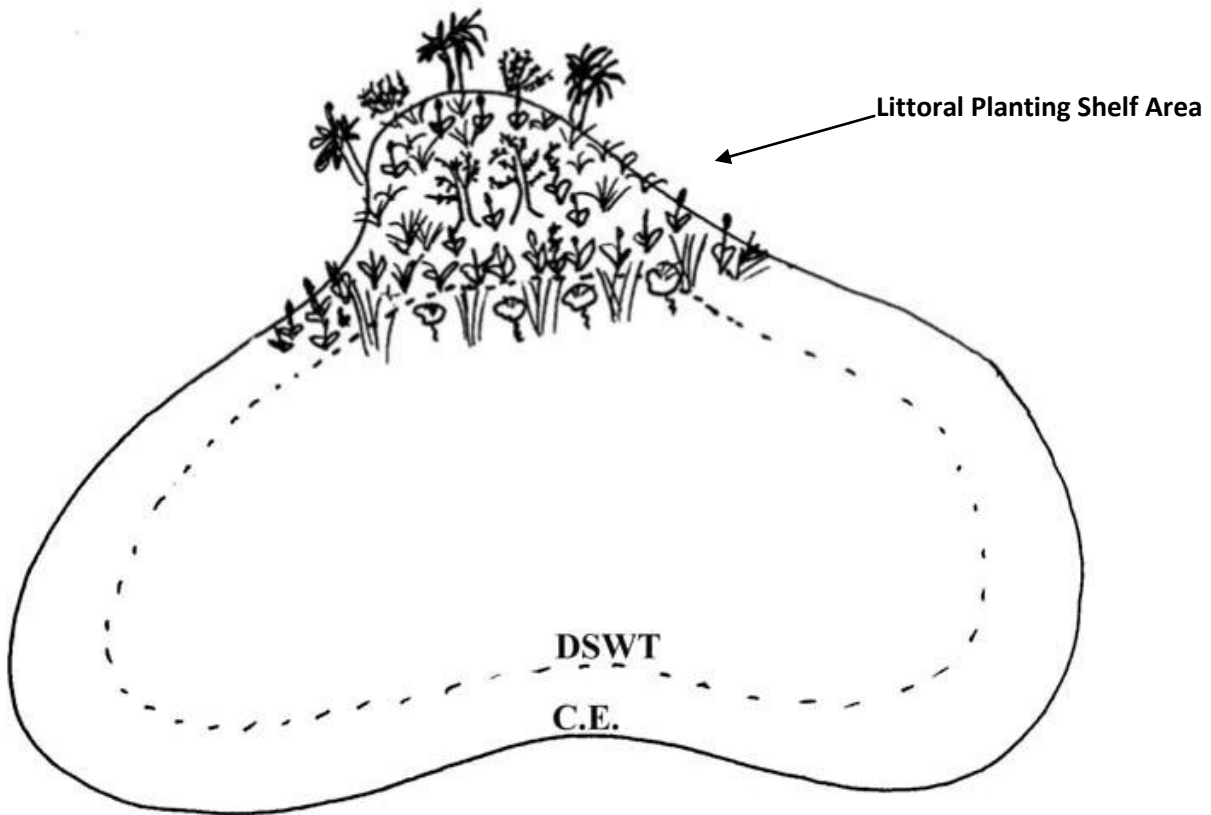


Figure 2

Each pond is different and designs can vary. Figures 3 – 8 represent possible LSPA design cross-sections. These are only suggested guides and the LSPA design should not be based solely on these figures.

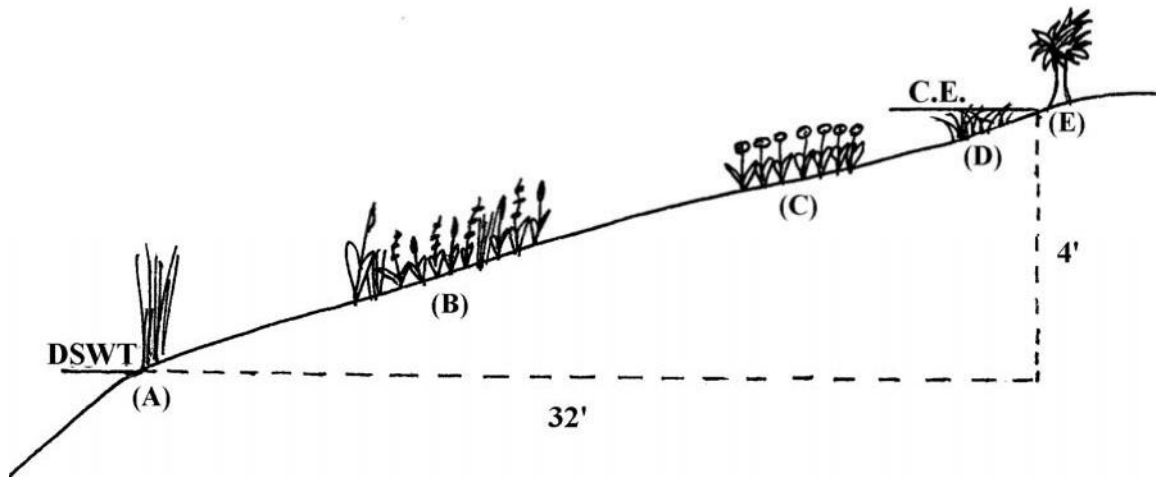


Figure 3

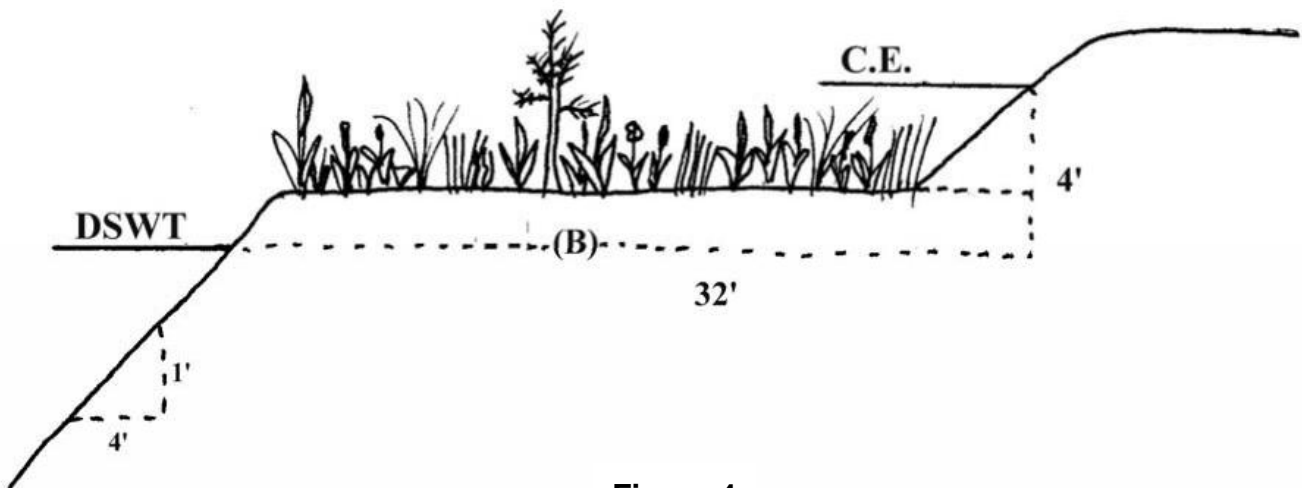


Figure 4

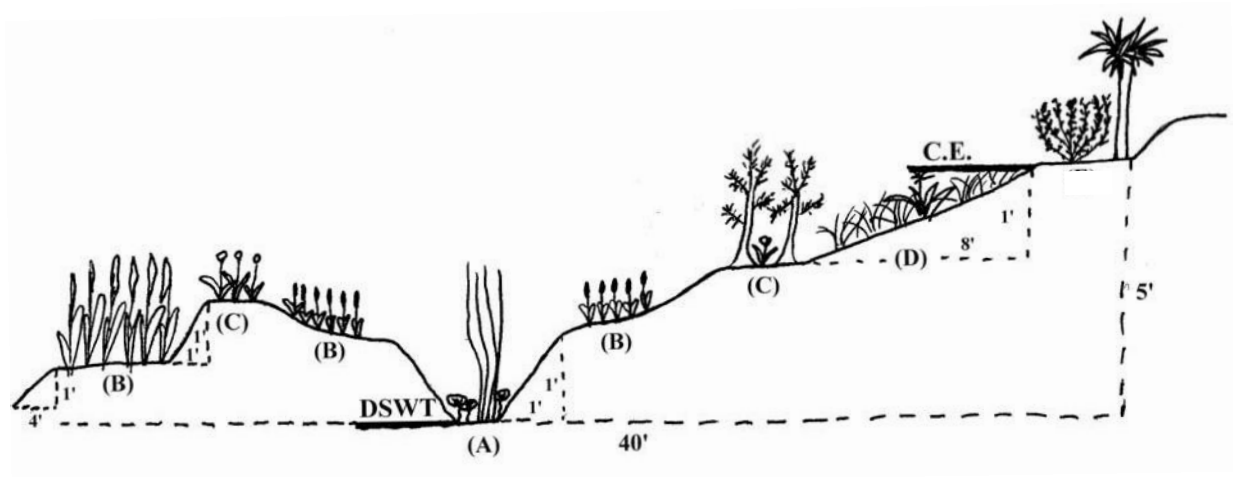


Figure 5

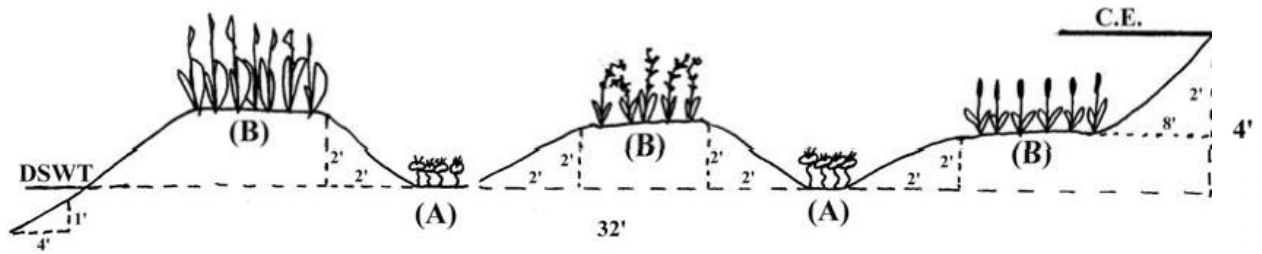


Figure 6

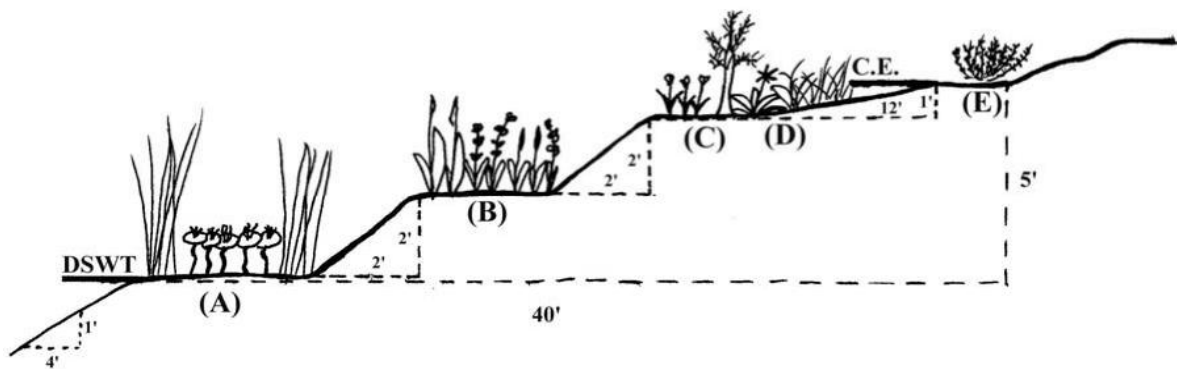
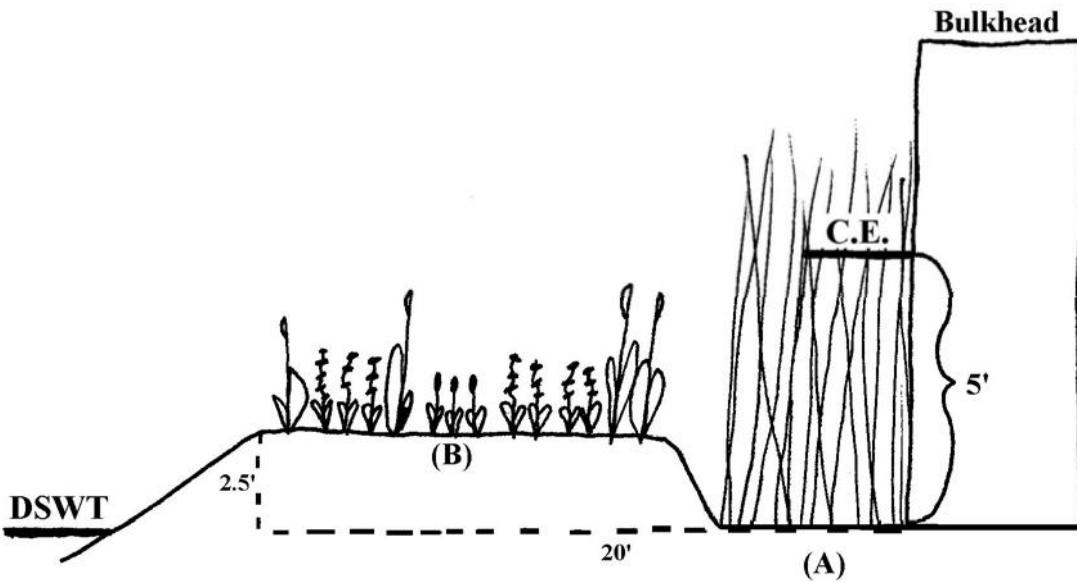


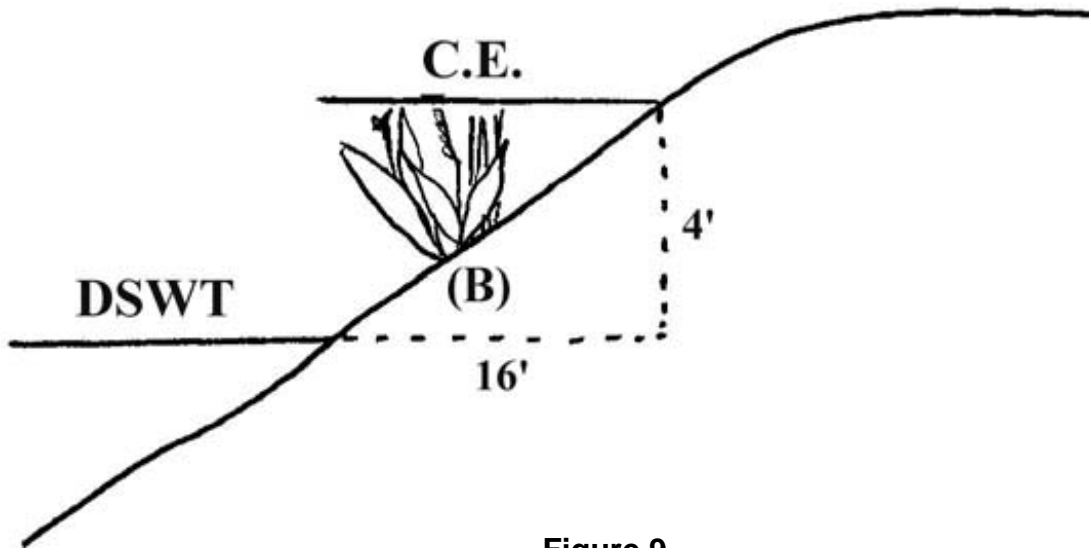
Figure 7



**Figure 8**

For retrofitting older ponds, refer to Collier County Land Development Code Chapter 3, [Section 3.05.10](#). Section C specifically outlines the requirements for existing lakes.

Historically, littoral shelves within Collier County have been planted on stormwater lake shorelines graded at a 4:1 slope (Figure 9). If your pond was in existence before 2001, you most likely have a 4:1 slope. This steep slope will limit the planting design to a thin strip of vegetation that lines the shore (Figure 10).



**Figure 9**

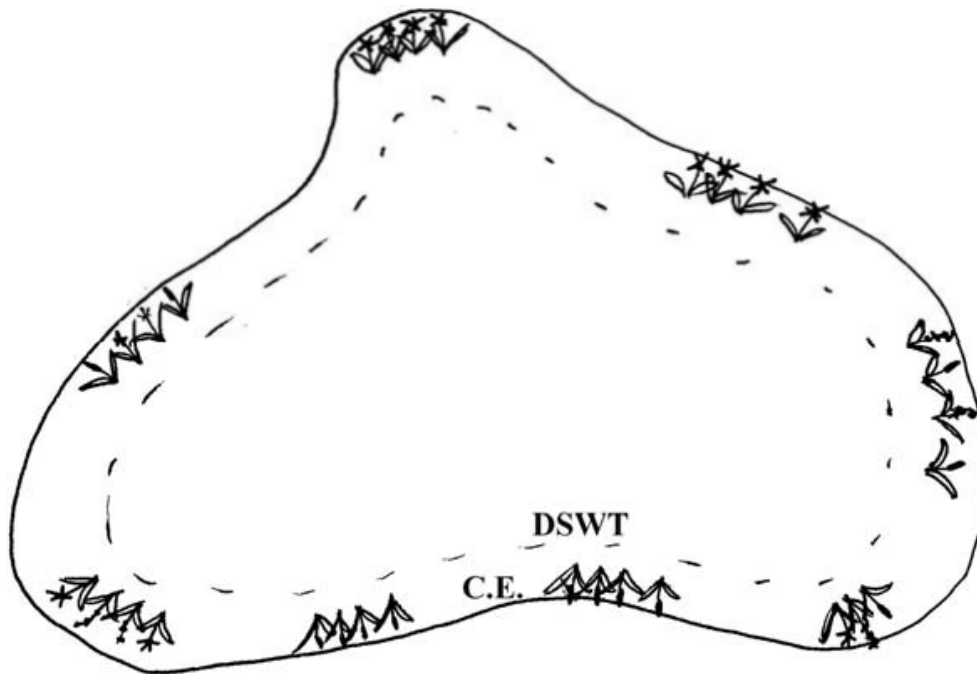


Figure 10

### Current LSPA Design Requirements and Other Suggestions

- The LSPA must have an average slope of 8:1. Terraced step- downs in elevation can have a larger slope as long as flatter areas are present to create an average slope of 8:1.
- Only the surface where the LSPA is planted is required to be at an 8:1 slope. The remaining shoreline can be sloped with a maximum 4:1 slope.
- If you have a steeper (>4:1 slope) shoreline outside the LSPA, [Bacopa](#) is a good ground cover that will follow the water line. It may brown slightly during drier months, but will benefit from irrigation run-off produced by existing sprinkler systems. Bacopa should help with erosion control on steeply sloped shorelines.
- GRASS CARP AND LSPAs DO NOT MIX!!!! [Grass carp](#) will eat aquatic plants. If you already have grass carp, you may need to exclude them from the LSPA's to prevent plant damage. Consult FL Fish and Wildlife for additional information <http://myfwc.com/wildlifehabitats/invasive-plants/grass-carp/>.



# Table 1: Suggested Plants for Littoral Shelf Planting Area (LSPA) and Stormwater Retention Ponds in Collier County



Proposed Elevation Below C.E. (feet)	Planting Zone	Plant type	Common Name	Scientific Name <b>spp. = multiple species within that genus</b>	Comments	Flooding Duration at Proposed Elevation (months)	Size/height requirement	Plant Spacing maximum
0 - 1'	Transition (D)	Herbaceous	Salt grass / spike grass	<a href="#"><i>Distichlis spicata</i></a>	Brackish water only	0 - 2	12" min	36" on center
0 - 1'	Transition (D)	Herbaceous	Muhly grass	<a href="#"><i>Muhlenbergia capillaris</i></a>		0 - 2	12" min	36" on center
0 - 1'	Transition (D)	Herbaceous	Seashore paspalum	<a href="#"><i>Paspalum vaginatum</i></a>	Brackish water only	0 - 2	12" min	36" on center
0 - 1'	Transition (D)	Herbaceous	Cord grass	<a href="#"><i>Spartina bakeri</i></a>		0 - 2	12" min	36" on center
0 - 1'	Transition (D)	Herbaceous	Fakahatchee grass	<a href="#"><i>Tripsacum dactyloides</i></a>	Can grow very tall but dwarf varieties are available	0 - 2	12" min	36" on center
1 - 2'	Shallow ( C )	Herbaceous	Blue maidencane	<a href="#"><i>Amphicarpum muhlenbergianum</i></a>		1 - 3	12" min	36" on center
1 - 2'	Shallow ( C )	Herbaceous	Canna lily	<a href="#"><i>Canna flaccida</i></a>	<b>Perennial accent plant</b>	1 - 3	12" min	36" on center
1 - 2'	Shallow ( C )	Woody-shrub	Button bush	<a href="#"><i>Cephalanthus occidentalis</i></a>		1 - 3	1gallon	5'
1 - 2'	Shallow ( C )	Woody-tree	Buttonwood	<a href="#"><i>Conocarpus erectus</i></a>		1 - 3	3gallon/ 4' min	20'
1 - 2'	Shallow ( C )	Herbaceous	Swamp lily	<a href="#"><i>Crinum americanum</i></a>	<b>Accent plant blooming in summer</b> ; mix in with other herbaceous vegetation due to it spreading slowly	1 - 3	12" min	36" on center
1 - 2'	Shallow ( C )	Herbaceous	Spikerush	<a href="#"><i>Eleocharis spp</i></a>		1 - 3	12" min	36" on center
1 - 2'	Shallow ( C )	Herbaceous	Horsetail	<a href="#"><i>Equisetum hyemale</i></a>	Naturalizes; food for waterfowl	1 - 3	12" min	36" on center
1 - 2'	Shallow ( C )	Woody-tree	Dahoon holly	<a href="#"><i>Ilex cassine</i></a>		1 - 3	3gallon/ 4' min	20'

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1 - 2'	Shallow ( C )	Woody-shrub	Christmas Berry	<a href="#"><i>Lycium carolinianum</i></a>	Brackish water only	1 - 3	1gallon/ 12" min	36" on center
1 - 2'	Shallow ( C )	Herbaceous	Muhly grass	<a href="#"><i>Muhlenbergia capillaris</i></a>	Colorful pink inflorescence	1 - 3	12" min	36" on center
1 - 2'	Shallow ( C )	Herbaceous	Maidencane	<a href="#"><i>Panicum hemitomon</i></a>	Can be confused with torpedo grass	1 - 3	12" min	36" on center
1 - 2'	Shallow ( C )	Herbaceous	Pickernelweed	<a href="#"><i>Pontedaria cordata</i></a>	Accent plant blooming late summer	1 - 3	12" min	36" on center
1 - 2'	Shallow ( C )	Woody-tree	Royal palm	<a href="#"><i>Roystonea regia</i></a>		1 - 3	3gallon/ 4' min	20'
1 - 2'	Shallow ( C )	Herbaceous	Arrowhead	<a href="#"><i>Sagittaria spp</i></a>		1 - 3	12" min	36" on center
2 - 3'	Mid (B)	Herbaceous	Canna lily	<a href="#"><i>Canna flaccida</i></a>	Perennial accent plant	3 - 6	12" min	36" on center
2 - 3'	Mid (B)	Herbaceous	Sawgrass	<a href="#"><i>Cladium jamaicense</i></a>		3 - 6	12" min	36" on center
2 - 3'	Mid (B)	Herbaceous	Blue flag	<a href="#"><i>Iris spp.</i></a>	Accent plant blooming in spring	3 - 6	12" min	36" on center
2 - 3'	Mid (B)	Herbaceous	Soft rush / Needle rush	<a href="#"><i>Juncus spp.</i></a>		3 - 6	12" min	36" on center
2 - 3'	Mid (B)	Woody-tree	Red (Swamp) maple	<a href="#"><i>Acer rubrum</i></a>		3 - 6	3gallon/ 4' min	20'
2 - 3'	Mid (B)	Woody-tree	Paurotis Palm	<a href="#"><i>Acoelorrhaphe wrightii</i></a>	Multi-stemmed small palm	3 - 6	3gallon/ 4' min	20'
2 - 3'	Mid (B)	Woody-tree	Cypress	<a href="#"><i>Taxodium spp</i></a>		3 - 6	3gallon/ 4' min	20'
3' - deeper	Deep (A)	Woody- shrub	Giant Leather fern	<a href="#"><i>Acrosticum danaeifolium</i></a>		6 - 9	1gallon	5'

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3' - deeper	Deep (A)	Woody-tree	Pond apple	<a href="#"><i>Annona glabra</i></a>	May not be commercially available	6 - 9	3gallon/ 4' min	20'
3' - deeper	Deep (A)	Herbaceous	Sawgrass	<a href="#"><i>Cladium jamaicense</i></a>	Serrated leaves install in areas with minimal maintenance needed. fresh and brackish	6 - 9	12" min	36" on center
3' - deeper	Deep (A)	Woody-tree	Pop ash	<a href="#"><i>Fraxinus caroliniana</i></a>		6 - 9	3gallon/ 4' min	20'
3' - deeper	Deep (A)	Herbaceous	Spatterdock	<a href="#"><i>Nuphar advena</i></a>	Small yellow flower	6 - 9	12"	N/A
3' - deeper	Deep (A)	Herbaceous	Water lily	<a href="#"><i>Nymphaea spp.</i></a>	Showy flower	6 - 9	N/A	N/A
3' - deeper	Deep (A)	Herbaceous	Bulrushes	<a href="#"><i>Scirpus spp.</i></a>	Grows very tall can block pond view	6 - 9	12" min	36" on center
3' - deeper	Deep (A)	Herbaceous	Alligator flag	<a href="#"><i>Thalia geniculata</i></a>		6 - 9	12" min	36" on center

## Reference

Gaff, H., DeAngelis, D.L., Gross, L.J., Salinas, R., and M. Shorrash. 2000.  
*Ecological Modeling* 127:33-52.